ACCESSING THE
ENERGY SAVINGS POTENTIAL
IN CALIFORNIA'S EXISTING BUILDINGS:

AN INTERIM REPORT TO THE LEGISLATURE IN RESPONSE TO AB 549

CALIFORNIA ENERGY COMMISSION

COMMISSION REPORT

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Arnold Schwarzenegger
Governor

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Introduction

California's existing building stock is vast and extremely diverse, with building types ranging widely from single family homes to high-rise multi-family buildings and from small businesses in strip malls to skyscrapers and cavernous warehouses. Most buildings, though, were constructed before California put energy efficiency standards in place for new construction. So, despite a quarter century of energy efficiency programs and standards, a large reserve of potential energy and peak demand savings remains to be tapped.

In this interim report, the California Energy Commission highlights the initial progress in investigating options for reducing energy consumption in California's existing buildings. Undertaken in response to Assembly Bill 549 (AB 549, Longville, Chapter 905, Statues of 2001), this report also recommends actions that can be taken now to reduce energy consumption in existing buildings.

Background

The electricity crisis of 2000 and 2001 resulted in skyrocketing electricity costs, dangerously low reserve margins, and rotating outages. While the electricity system appears stabilized for now, California could easily find itself in a situation similar to 2000-2001 in the near future, unless the state takes aggressive steps to reduce energy demand, increase supply, and expand transmission capacity for electricity and natural gas.

In enacting AB 549, the California Legislature and the Governor recognized that reducing energy consumption and peak demand is one of the least costly and most expeditious tools for improving the reliability and cost of energy in the state. In particular, the Legislature recognized the potentially large energy savings in California's stock of millions of existing buildings. AB 549 directs the Energy Commission to undertake the following:

> …investigate options and develop a plan to decrease wasteful peakload energy consumption in existing residential and nonresidential buildings. On or before January 1, 2004, the Energy Commission shall report its findings to the Legislature, including, but not limited to, any changes in law necessary to implement the plan…

Energy efficiency is a cornerstone of the state's energy policy, as articulated in two recently adopted energy policy documents, the *2003 Integrated Energy Policy Report* and the *Energy Action Plan. The 2003 Integrated Energy Policy Report* recommends increasing funding for energy efficiency programs to achieve at least an additional 1,700 megawatts of peak electricity demand reduction and energy savings of 6,000 gigawatt-hours of electricity and 100 million therms of natural gas by 2008. The *Energy Action Plan*, adopted by the Energy Commission, the California Public Utilities Commission (CPUC), and the California Power Authority, set a goal of reducing per capita electricity consumption. The specific recommendations from the AB 549 investigation will play a critical role in developing policies to meet the energy efficiency goals set by these agencies.

Although the bill originally included funding and positions to develop the plan, in the final bill, the resources were removed because of budget constraints, and the Energy Commission was encouraged to seek funds for a public/private partnership. The Energy Commission staff pursued several possible funding sources, including private business, foundations, the U.S. Department of Energy, and the CPUC. The Energy Commission avoided funding from private businesses that could benefit from the conclusions of the report because this could compromise the credibility of the report.

Ultimately, funding for the first phase of work was obtained from the statewide Codes and Standards Enhancement program under the Public Goods Charge Energy Efficiency program administered by the California investor-owned utilities subject to CPUC oversight. Those funds, however, were restricted to a study of efficiency measures and strategies that could be used in future codes and standards related to existing buildings.

At the time of publication, the California Measurement Advisory Committee (CALMAC) plans to recommend that the CPUC provide the remaining funding needed to analyze voluntary mechanisms for improving efficiency in existing buildings. CALMAC is a forum for the development, discussion, and review of market assessment and evaluation studies for public goods charge-funded energy efficiency programs. If the CPUC approves CALMAC's recommendation, the funding would be sufficient to complete the project.

Project Objectives and Challenges

The AB 549 project focuses on energy and peak savings opportunities that are beyond the scope and authority of existing programs. These programs, which are aimed at reducing energy consumption in existing buildings as well as in new construction and industrial processes, include the public goods charge energy efficiency program, building energy efficiency standards for new construction, and appliance energy efficiency regulations.

The objectives for the AB 549 project are to:

1. Identify *new* opportunities for reducing peak energy consumption in existing buildings that are beyond the scope or outside the authority of current programs and standards setting processes,
2. Quantify the costs and savings for these new activities, and
3. Develop a comprehensive plan that effectively targets these activities and is well coordinated with existing activities and programs.

When AB 549 became law in October 2001, the Energy Commission was administering $377 million in new peak load reduction programs, as directed by the Legislature, and was undertaking proceedings to update its building and appliance energy efficiency standards on an emergency basis. Since the new bill did not provide funding or positions to implement its provisions, the Energy Commission did not initiate the project until late 2002. Unprecedented budget and staffing cuts have further hampered progress.

Progress to Date

Staff has completed the first research phase: characterizing the existing buildings market and analyzing energy efficiency measures appropriate for consideration for possible codes and standards action. The next research phase will examine the full range of energy efficiency opportunities, including mechanisms for encouraging voluntary efficiency improvements.

To date, the Energy Commission has:

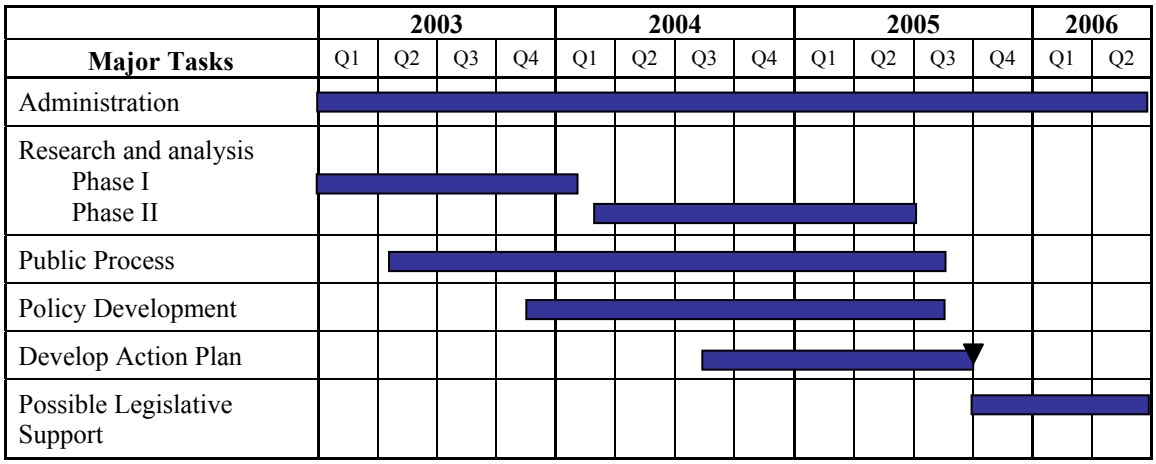
- Established communication with key industry stakeholders.
- Held two public workshops with a wide range of participants, including the building industry, environmental groups, electric utilities, and contractors.
- Completed reports characterizing the existing buildings market and analyzing efficiency opportunities to be gained through codes and standards.
- Pursued funding to complete research and analysis for the project.

Work products, transcripts of the workshops, and additional project information are available at [www.energy.ca.gov/ab549].

Next Steps

The Energy Commission plans to continue the AB 549 project as shown in Table 1 given that adequate funding for the work has only recently been identified. If the CPUC approves funding for the second phase of research in early 2004, the Energy Commission will release a request for qualifications to hire a contractor for this work by spring 2004.

Table 1
Project Schedule for Assembly Bill 549



The Energy Commission will analyze the range of new opportunities for reducing energy use in existing buildings and quantify their potential energy savings. Stakeholder working groups are planned to identify opportunities and strategies for key areas such as encouraging use of advanced controls and energy ratings.

The Energy Commission will develop implementation options capable of achieving the largest amount of energy and peakload savings with the least cost to California consumers and businesses. The options will include both voluntary strategies and regulations that facilitate changes in the market to improve energy efficiency in existing buildings. Some strategies will require a combination of approaches.

The options will be evaluated for cost effectiveness and viability. To be included in the AB 549 report, implementation strategies must have a feasible implementation path, the necessary support infrastructure to implement the strategy, and where possible, support from key stakeholders and affected parties.

The preferred implementation strategies will be presented in a comprehensive action plan that accounts for the synergies among individual strategies. The plan will recommend a sequence of actions for capturing the desired level of reductions in peak electric demand and overall energy use.

Interim Findings

As a first step, the residential and nonresidential markets were analyzed to gain an understanding of the characteristics of the markets to determine what energy efficiency measures should be included in our recommendations.

Residential Buildings

Table 2 shows the breakdown of types of residential housing units in California. Rental units account for 43 percent of this market, where the occupancy is short-term and the majority of units are in multi-family buildings.

Rentals present a unique challenge in terms of improving energy efficiency because the property owners have little incentive to invest in energy efficiency improvements, since they rarely pay the energy bills. While the tenants benefit from any energy savings, they have a disincentive to make permanent improvements to units they do not own, and they may not be allowed to make such improvements.

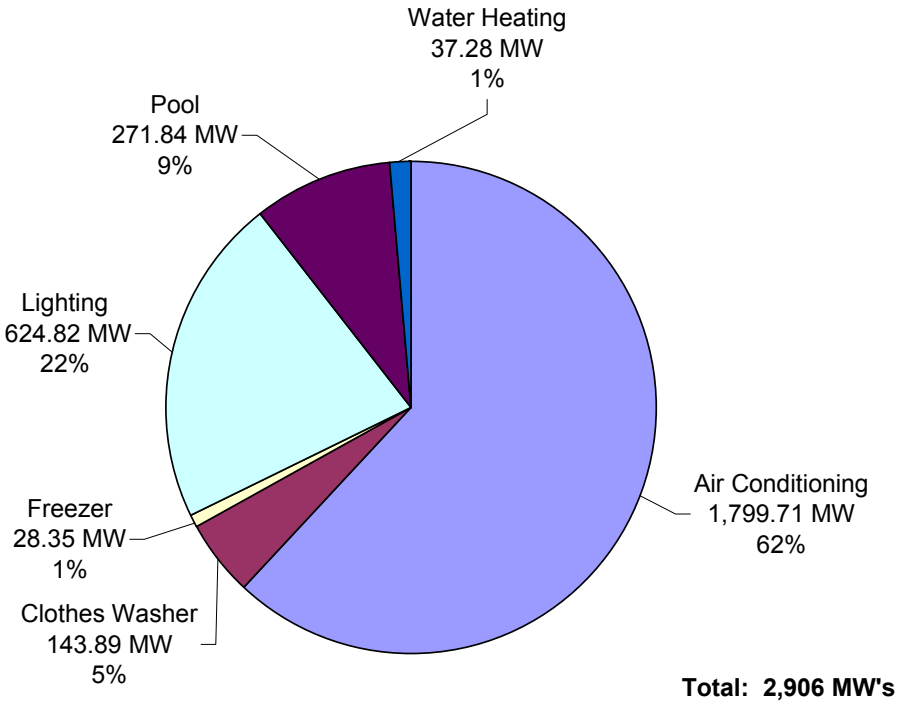
Table 2
Types of Housing Units in California
(U.S. bureau of the Census, Census 2000)

	Total Units
Single-Family	7.8 million
Multi-Family (2-4 units)	1.0 million
Multi-Family (5 or more units)	2.9 million
Mobile Home	0.5 million
Total Housing Units	**12.2 million**

Nearly seven million units, more than half of the total, were built before the first residential energy efficiency standards took effect in 1975. These older homes often have the highest energy costs compared to new homes built since 1975, and they have numerous opportunities for efficiency improvements. However, most of the remaining five million homes built under the energy efficiency standards also have substantial room for improvement for two reasons. First, several very significant upgrades were made to the energy efficiency standards in the last few years. Second, studies have shown that the energy performance of homes suffer from leaky or constricted ducts, improperly installed insulation, and non-optimized refrigerant charge and air flow in air conditioning systems — problems not addressed in earlier versions of the standards.

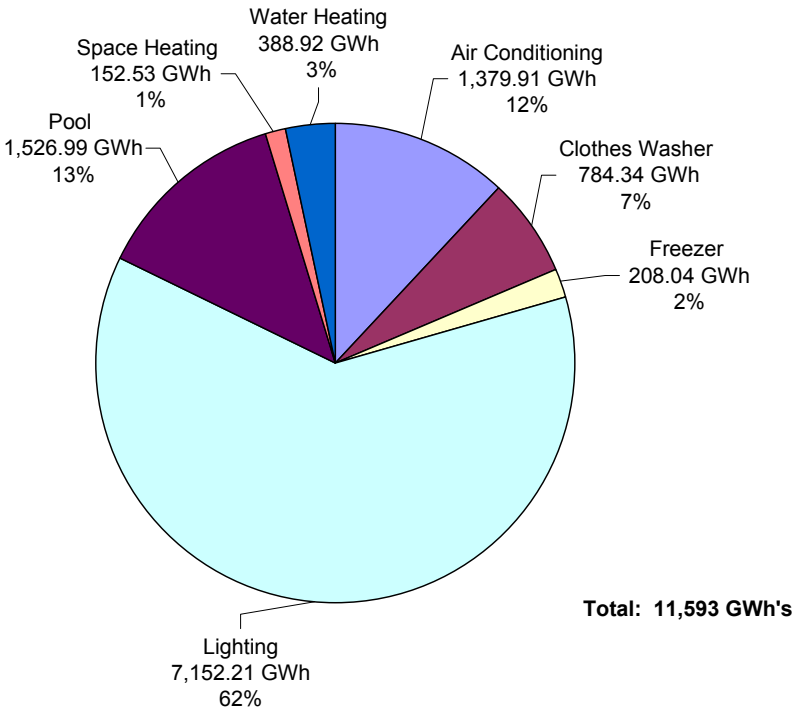
In 1997, the average California household spent $1,009 annually on electricity, natural gas, and propane. Figure 1 represents the potential peak capacity (megawatt) savings that could be achieved annually statewide by improvements in existing homes. These savings assume that all owners could be persuaded to invest in all of the remaining cost-effective energy efficiency measures that had not been installed in these homes by 2002 and that have either a payback of less than 10 years or a levelized cost less than the marginal cost of energy — measures such as air conditioning upgrade, lighting, pool mechanism upgrade, or clothes washer replacement. Figure 2 represents the potential total annual energy (gigawatt hours) savings that could be achieved under the same circumstances. Additional detail is shown in Appendix 1. As shown in Figures 1 and 2, space cooling, lighting, pool mechanisms, and clothes washer replacement are the key areas to focus on for future improvements.

Figure 1
Potential Annual Peak Savings From
Existing Residential Buildings



Source: Derived from the Energy Commission's Staff Report *Proposed Energy Savings Goals for Energy Efficiency Programs in California* (Publication Number 100-03-021), prepared in support of the *2003 Integrated Energy Policy Report Proceeding* (02-IEP-01).

Figure 2
Potential Annual Energy Savings From Existing Residential Buildings



Source: Derived from the Energy Commission's Staff Report *Proposed Energy Savings Goals for Energy Efficiency Programs in California* (Publication Number 100-03-021), prepared in support of the *2003 Integrated Energy Policy Report Proceeding* (02-IEP-01).

In developing a strategy to capture these savings, the Energy Commission has identified and investigated "trigger events" that represent opportunities for making efficiency improvements. For example, the sale of a home could be an opportunity to provide the buyer with information about needed efficiency upgrades that could be financed as part of the mortgage or to require that certain efficiency improvements be made by the seller. Nearly a quarter million pre-1975 homes are sold each year. Other trigger events include refinancing, alterations, and replacing of appliances and equipment.

Nonresidential Buildings

The nearly six billion square feet of nonresidential building stock is extremely diverse. The largest nonresidential building occupancy types by floor area are:

large offices	17%
retail	16%
non-refrigerated warehouses	13%

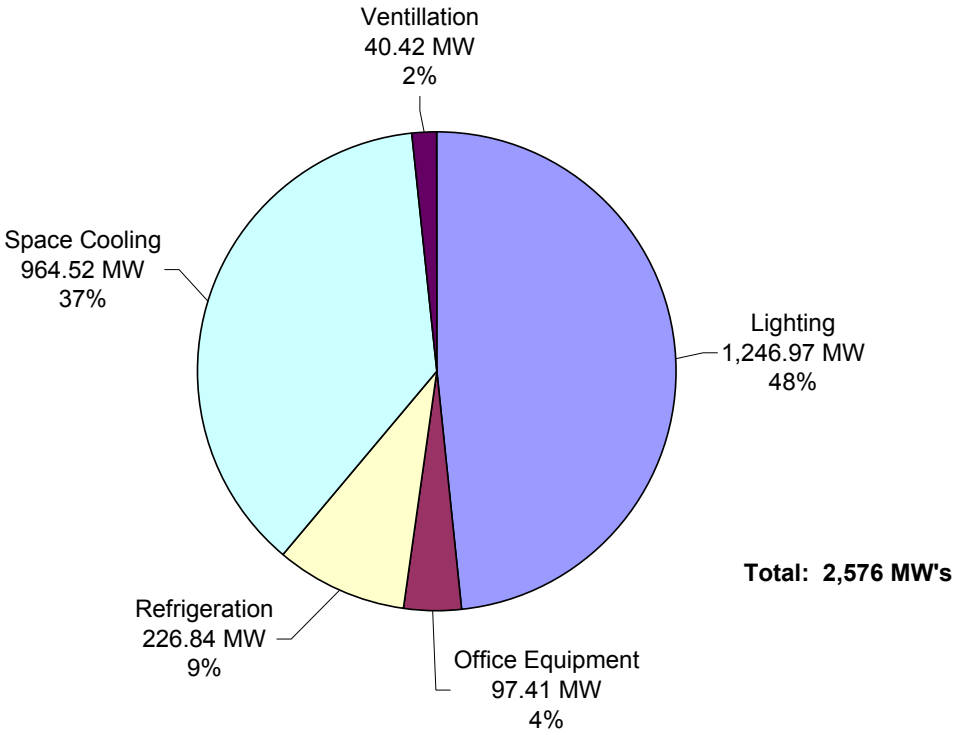
Note: Partial listing highlighting largest occupancy types

Twenty percent of nonresidential floor space was built before the first nonresidential building efficiency standards went into effect in 1975. Although utility programs and building and appliance codes have improved the energy efficiency of existing buildings, many opportunities remain, particularly in schools and colleges, that have a larger proportion of older buildings and fewer resources to upgrade them.

Figure 3 represents the potential peak capacity (megawatt) savings that could be achieved annually statewide by improvements in existing commercial buildings. The calculations assume that building owners could be persuaded to invest in all of the remaining cost effective energy efficiency measures such as upgrades in lighting, space cooling, and refrigeration. These measures have a payback of less than 10 years or a levelized cost that is less than the marginal cost of energy, and had not been installed in these buildings by 2002.

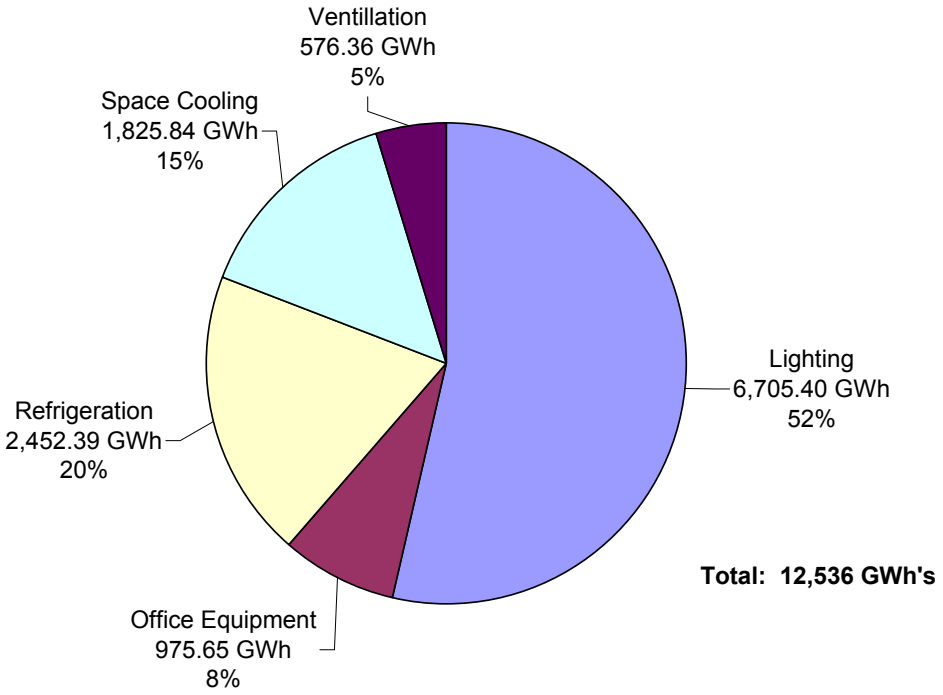
Figure 4 represents the potential total annual energy (gigawatt hours) savings that could be achieved under the same circumstances. Additional detail is shown in Appendix 2. As with existing homes, lighting and space cooling, along with refrigeration, stand out as areas to focus on for new energy efficiency activities in nonresidential buildings.

Figure 3
Potential Annual Peak Savings From
Existing Commercial Buildings



Source: Derived from the Energy Commission's Staff Report *Proposed Energy Savings Goals for Energy Efficiency Programs in California* (Publication Number 100-03-021), prepared in support of the *2003 Integrated Energy Policy Report Proceeding* (02-IEP-01).

Figure 4
Potential Annual Energy Savings From
Existing Commercial Buildings



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As in the residential buildings sector, the time of sale is one of the most opportune times to improve the energy efficiency and reduce the summer peak demand of older nonresidential buildings. The escrow process provides a control point to require actions that facilitate energy efficiency upgrades, and the buyer has access to low cost capital via the mortgage. Other key trigger events include leasing, alterations, and equipment replacement.

Benefits of Improving Existing Building Efficiency

The benefits of energy efficiency improvements accrue directly to the building owner and occupants in the form of improved comfort, improved indoor air quality, increased productivity of workers, and financial savings. Yet all Californians benefit as well, because the reduced demand for energy displaces some of the state's need for new power plants, transmission lines, and natural gas pipeline capacity — and at a much lower cost. This in turn has a positive impact on environmental quality. The expenditures on energy efficiency measures and the utility savings to end users represent additional dollars entering California's economy, which stimulate

economic development and provide new jobs in the areas of installation, manufacturing, and distribution of energy efficient products and services while increasing local and state tax revenues. RAND's March 2000 report *The Public Benefit of California's Investments in Energy Efficiency* showed that improvements in energy efficiency between 1977 and 1995 added 3 percent to the rate of economic growth in the state during that period.

Interim Recommendations

Actions to Pursue Immediately

During the initial research and public workshops, several ideas emerged that can be undertaken using existing programs without new legislation. These ideas, however, may be beyond what is possible with current resources. The Energy Commission plans to:

- Ensure that current energy efficiency planning activities are coordinated. Both the *2003 Integrated Energy Policy Report* and the three-agency *Energy Action Plan* set ambitious energy efficiency goals for the state. The CPUC has initiated a proceeding to plot the direction of public goods charge-funded energy efficiency programs in the future. The high degree of coordination taking place in these proceedings has brought continuity to programs and planning efforts which should be continued.

- Consider additional measures for future updates to the building efficiency standards that affect alterations to existing buildings. These include three main measures. The first measure would add nonresidential lighting controls, which are controls capable of responding to signals to reduce electrical demand during critical peak periods. The second measure would add controls for boilers in multi-family buildings to optimize boiler efficiency. The third measure would expand the current requirement to use "cool" roofing materials for certain types of roof replacements.

- Consider measures for future updates to the appliance efficiency standards. Appliance standards affect equipment purchases for existing buildings. A possible candidate for future update could be the demand responsive thermostat. Information to help determine the impact of the demand responsive thermostat will be forthcoming from the Demand Response Rulemaking where the Energy Commission and the CPUC are jointly managing research pilots.

- Complete the process for certifying home energy rating systems (HERS). Several stakeholders emphasized that it is important for the Energy Commission to complete the development of a certification process for HERS methods in California. Although the development of this process has been delayed because of a lack of resources, it is a necessary step towards widespread evaluation and rating of the energy efficiency of existing homes.

- Support efforts by local governments to adopt local energy efficiency ordinances for existing buildings. Several California cities and counties have developed local ordinances requiring

certain upgrades in existing buildings. While these vary in scope and design, more widespread adoption of such ordinances could be encouraged by providing technical assistance and planning tools to local governments wishing to develop local energy ordinances. Local programs could serve as a testing ground for mechanisms that may ultimately be appropriate statewide.

Actions Needing Legislative Support

The Energy Commission plans to pursue legislation to remove barriers to energy efficiency improvements. For example, a growing number of neighborhoods are part of "common interest communities" where exterior home modifications must meet the requirements of the local covenants codes and restrictions (CC&Rs) and be reviewed and approved by a homeowners association. Some homeowners have been prohibited from adding high efficiency windows or exterior shading devices such as awnings, shutters, and solar screens that reduce peak air conditioning loads.

Currently, Section 714 of the California Civil Code prohibits unreasonable restrictions of residential solar installations. The code could be amended to apply to devices that reduce energy costs in a manner that allows homeowners associations to influence the aesthetics of the installations without blanket prohibitions of classes of products.

Promising Options that Require Additional Research

The initial research has revealed several promising areas that will require further investigation and discussion with stakeholders in public forums and working groups. Additional opportunities are expected to emerge during the next phase of the research.

Promote Evaluation of the Energy Performance of Existing Buildings

Each building is unique. A building’s needs for energy efficiency improvements depend on the climate in which it resides, the age of the building, the age and efficiency of its equipment, the extent to which some upgrades have already been made, and a variety of other factors. To identify the full range of cost-effective energy efficiency improvements, most buildings would require a comprehensive evaluation of the energy performance of the building shell and energy consuming equipment.

For residential buildings, home energy rating systems provide an effective tool for determining the relative energy performance of a particular house and identifying cost-effective improvements. In addition, more comprehensive diagnostic tools appear to have the potential to facilitate the accomplishment of greater residential energy savings.

The counterpart evaluation for nonresidential buildings is accomplished through building commissioning. "Retrocommissioning" is an extensive reexamination and fine-tuning of the systems in an existing commercial building to be energy efficient and to meet comfort requirements and other operational needs. Retrocommissioning also identifies cost-effective improvements to save energy in the building.

The AB 549 research will investigate options for encouraging or requiring the use of such approaches to evaluate the energy performance of individual buildings. This may promote evaluation techniques through education, training, or incentives. It may also be appropriate to require energy ratings, retrocommissioning, or information about ratings or retrocommissioning at key trigger events. For example, the sale or lease of a building could be contingent on having a rating or retrocommissioning done, and the results provided to prospective buyers or tenants.

Encourage or Require Efficiency Upgrades

While many of the buildings constructed before energy efficiency building standards existed have been retrofitted, a large number of older buildings still lack basic measures to maintain comfort and keep energy costs within reason. Many single- and multi-family homes have inadequate insulation, a leaky building envelope, and antiquated heating and cooling equipment. Some older nonresidential buildings have inefficient lighting and poorly performing heating, ventilation, and air conditioning systems.

The Energy Commission plans to identify the most cost-effective and beneficial energy efficiency improvements and examine whether new and existing incentive programs can adequately penetrate the existing building stock. If not, the Energy Commission will examine whether additional incentives are needed or if certain buildings should be subject to mandatory efficiency upgrades at time of sale, based perhaps on building type, age, and climate zone.

Support Development and Use of Advanced Controls

Controls on energy using equipment can reduce energy consumption and peak demand by optimizing the operation of equipment and preventing its unnecessary use. ”Smart” controls are available that can learn from occupant use to further optimize control strategies over time. Control systems can also include fault detection functions that self-correct the problem with the equipment or provide warnings of incorrect operation. Demand responsive controls communicate with a utility or receive a signal indicating that a critical event is occurring that threatens the reliability of the electricity system or that the real-time cost of electricity is excessive. Demand responsive controls can warn the building operator to lower energy use or execute pre-programmed actions.

The Public Interest Energy Research program is researching advanced controls, and a demand response proceeding is under way at the CPUC to examine ways to induce shifts in electricity use to off-peak times. The AB 549 recommendations will be closely coordinated with these activities to provide mechanisms for getting this technology into existing buildings so that

building owners can take advantage of time-sensitive rates or respond to requests to reduce peak demand.

Conclusions

California's existing building stock offers significant potential for reducing energy consumption and peak demand in the state. The Energy Commission plans to submit a report to the Legislature by October 2005 that lays out actions to capture more of this potential than possible through existing programs and standards. Further research is necessary to define these options and quantify the level of savings that can be expected to occur. In the meantime, this report lays out some interim steps which, along with other ongoing proceedings and programs, can accelerate progress in improving the energy efficiency of California’s existing building stock. This will contribute to a more stable energy supply system and lower energy prices.

APPENDIX 1: POTENTIAL ANNUAL SAVINGS FROM EXISTING RESIDENTIAL BUILDINGS

End Use	Measure		GWH savings	Levelized Cost per KWH saved $ per KWh	MW savings	Levelized Cost per KW saved $ per KW
Central AC	Double Pane Clear Windows to Double Pane, Med Low-E Coating	0.087297284	1007.52	$0.02	1317.50	$14.60
Central AC	Duct Insulation (0.4)	0.086261715	34.72	$0.10	45.95	$79.20
Central AC	Ceiling R-0 to R-19 Insulation-Batts (0.29)	0.110144129	66.24	$0.12	68.65	$116.09
Central AC	TXV	0.088297405	148.52	$0.13	192.02	$100.42
Room AC	Double Pane Clear Windows to Double Pane, Med Low-E Coating	0.079904437	122.91	$0.05	175.59	$32.34
		Air Conditioning	**1379.91**	**Air Conditioning**	**1799.71**	
			11.90%		61.93%	
Clothes Washer	SEHA CW Tier 2 (EF=3.25)	0.622254141	784.34	$0.06	143.89	$349.68
		Clothes Washer	**784.34**	**Clothes Washer**	**143.89**	
			6.77%		4.95%	
Freezer	High Effiency Freezer	0.837729328	208.04	$0.06	28.35	$469.93
		Freezer	**208.04**	**Freezer**	**28.35**	
			1.79%		0.98%	
Lighting	Compact Fluorescent Lamp, 6.0 hr/day	1.306711947	2515.43	$0.03	219.75	$342.08
Lighting	Compact Fluorescent Lamp, 2.5 hr/day	1.306711947	4636.78	$0.03	405.07	$385.21
		Lighting	**7152.21**	**Lighting**	**624.82**	
			61.69%		21.50%	
Pool	High Efficiency Pool Pump and Motor	0.641249791	1526.99	$0.03	271.84	$161.00
		Pool	**1526.99**	**Pool**	**271.84**	
			13.17%		9.35%	
Space Heating	Ceiling R-0 to R-19 Insulation-Batts	9999	152.53	$0.06	0.00	
		Space Heating	**152.53**	**Space Heating**	**0.00**	
			1.32%		0.00%	
Water Heating	Water Heater Blanket	1.19106556	152.81	$0.01	14.65	$88.36
Water Heating	Pipe Wrap	1.19106556	29.51	$0.02	2.83	$166.25
Water Heating	Faucent Aerators	1.19106556	35.00	$0.02	3.35	$252.63
Water Heating	Low Flow Showerhead	1.19106556	53.79	$0.03	5.16	$279.59
Water Heating	HE Water Heater (EF=0.93)	1.19106556	117.81	$0.06	11.29	$602.06
		Water Heating	**388.92**	**Water Heating**	**37.28**	
			3.35%		1.28%	
		Total Existing Residential GWh	**11,592.94**	**Total Existing Residential MW**	**2,905.88**	
			100.00%		**100.00%**	

Derived from the Energy Commission's Report "Proposed Energy Savings Goals for Energy Efficiency Programs in California" (Publication Number 100-03-021), prepared in support of the 2003 Integrated Energy Policy Report Proceeding (02-IEP-01).

APPENDIX 2: POTENTIAL ANNUAL SAVINGS FROM EXISTING COMMERCIAL BUILDINGS

End Use	Measure		GWH savings	Levelized Cost per KWH saved $ per KWh	MW savings	Levelized Cost per KW saved $ per KW
Exterior Lighting	High Pressure Sodium 250W Lamp		360.12	$0.05	3.06	$6,151.48
Exterior Lighting	Outdoor Lighting Controls (Photocell/Timeclock)		267.14			
Exterior Lighting	T8 fixture with 1 electronic ballast		125.48	$0.06	1.18	$6,208.09
Interior Lighting	T8 fixture with reflector & 1 electronic ballast		270.86	$0.00	54.57	$11.59
Interior Lighting	T8 fixture with 2 lamps, reflector & 1 electronic ballast		453.05	$0.01	95.90	$27.03
Interior Lighting	T8 fixture with 8 lamps, reflector & 1 electronic ballast		417.49	$0.01	77.72	$55.84
Interior Lighting	T8 fixture with 4 lamps, reflector & 1 electronic ballast		818.16	$0.02	140.07	$144.09
Interior Lighting	T8 fixture with 4 lamps & 1 electronic ballast		936.71	$0.04	197.33	$185.29
Interior Lighting	T8 fixture with 2 lamps & 1 electronic ballast		827.62	$0.07	165.99	$341.58
Interior Lighting	T12 fixture with 2 lamps, reflector & 1 electronic ballast		980.90	$0.07	183.35	$382.74
Interior Lighting	Occupancy Sensor, 4L4' Fluorescent Fixtures		509.60	$0.05	137.19	$167.25
Interior Lighting	Occupancy Sensor, 8L4' Fluorescent Fixtures		590.08	$0.05	153.64	$173.13
Interior Lighting	Occupancy Sensor, 4L8' Fluorescent Fixtures		148.21	$0.07	37.00	$289.58
		Lighting	**6705.40**	**Lighting**	**1246.97**	
			53.49%		48.40%	
Office Equipment	Network Power Management Enabling	1.118968593	501.87	$0.01	51.20	$55.35
Office Equipment	Power Management	1.434495495	144.19	$0.02	11.47	$297.85
Office Equipment	Power Management Enabling	1.083035624	329.60	$0.05	34.74	$515.51
		Office Equipment	**975.65**	**Office Equipment**	**97.41**	
			7.78%		3.78%	
Refrigeration	Efficient compressor motor retrofit	0.830839328	407.91	$0.01	56.05	$46.20
Refrigeration	Demand Hot Gas Defrost	0.830839328	50.45	$0.01	6.93	$49.02
Refrigeration	Floating head pressure controls	9999	218.16	$0.01	0.00	
Refrigeration	Strip curtains for walk-ins	0.830839328	84.71	$0.01	11.64	$102.37
Refrigeration	Anti-sweat (humidistat) controls	1.580178595	279.84	$0.02	20.22	$222.06
Refrigeration	Night covers for display cases	9999	310.72	$0.02	0.00	
Refrigeration	High-efficiency fan motors	0.830832563	678.61	$0.04	93.24	$296.66
Refrigeration	Compressor VSD retrofit	1.580169404	294.96	$0.05	21.31	$657.84
Refrigeration	Refrigeration Commissioning	0.830830797	127.03	$0.07	17.45	$519.85
		Refrigeration	**2452.39**	**Refrigeration**	**226.84**	
			19.56%		8.81%	
Space Cooling	Prog. Thermostat - DX	0.686740022	312.69	$0.02	51.98	$134.79
Space Cooling	Centrifugal Chiller, 0.51 kW/ton, 300 tons	0.173182537	540.28	$0.02	356.13	$25.66
Space Cooling	DX Packaged System, EER=10.9, 10 tons	0.206131742	502.87	$0.07	278.49	$119.92
Space Cooling	Window Film (Standard)	0.217340336	212.93	$0.09	111.84	$167.84
Space Cooling	EMS - Chiller	0.176697195	257.07	$0.10	166.08	$150.48
		Space Cooling	**1,825.84**	**Space Cooling**	**964.52**	
			0.15		37.44%	
Ventillation	Variable Speed Drive Control, 40 HP	2.052986001	236.32	$0.02	13.14	$356.04
Ventillation	Fan Motor, 15hp, 1800rpm, 92.4%	0.660099581	39.74	$0.02	6.87	$123.20
Ventillation	Variable Speed Drive Control, 15 HP	2.013914808	190.20	$0.04	10.78	$625.69
Ventillation	Fan Motor, 40hp, 1800rpm, 94.1%	0.593532362	24.33	$0.05	4.68	$271.06
Ventillation	Variable Speed Drive Control, 5 HP	1.979487499	85.77	$0.07	4.95	$1,168.42
		Ventillation	**576.36**	**Ventillation**	**40.42**	
			4.60%		**1.57%**	
		Total Existing Commercial GWh	**12,535.65**	**Total Existing Commercial MW**	**2,576.16**	
		Total Existing Residential and Commercial GWh	**24,128.59**	**Total Existing Residential and Commercial MW**	**5,482.04**	

Derived from the Energy Commission's Staff "Proposed Energy Savings Goals for Energy Efficiency Programs in California" (Publication Number 100-03-021), prepared in support of the 2003 Integrated Energy Policy Report Proceeding (02-IEP-01).